

Faculty of Natural and Technical Sciences, University “Goce Delčev”-Štip, R. Macedonia with a grant from the CEI-ES Know How Programme organize



**1st INTERNATIONAL WORKSHOP
ON THE PROJECT**

**Environmental Impact assessment of the Kozuf
metalogenic district in southern Macedonia in
relation to groundwater resources, surface
waters, soils and socio-economic
consequences (ENIGMA)**

PROCEEDINGS

**Edited by:
T. Serafimovski & B. Boev
Kavadarci, 10th October 2013**

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WINE GEOCHEMISTRY IN THE TIKVES REGION

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Abstract

In the paper VINE GEOCHEMISTRY IN THE TIKVES REGION are presented the results of the geochemical researches of a determined quantity of homemade wine (the presence of the elements Al, Ba, Ca, Cu, K, Mg, Mn, Na, Sr, As, Cd, Co, Cr, Ni, Pb, Zn) through the usage of the method ICP-AES and AAS, as well as the presence of the above mentioned elements in the appropriate soil systems. In the paper we make a comparison on the determined elements with the wines produced industrially in the wineries in Republic of Macedonia.

Key words, vine geochemistry, Tikves

Intruction

It is believed that the wine production is as old as the civilization. The wine is a concoction which is integral part of the human nutrition and had played a significant role in the development of the society, religion and culture. Like any other skill, the wine production was based on empirical conclusions, marking of some external appearances without entering into the essence of the process. This way of production was practiced for centuries, until Pasteur who, with his book “Study for the wine” (1866) opened the doors of the science for understanding the processes that happen during the wine production. The new scientific results and the technical technological achievements are a base for a progress of each branch of the industry, including the wine industry.

The wine as a product of the alcohol fermentation of the grape juice contains in itself large number of compounds, out of which some are in the grape juice, while other appeared during the alcohol fermentation, with the transformation of the sugar in some compounds. All those compounds enter in the geochemical composition of the wine, determining its quality which is manifested through the organic leptical features of the wine. For the quality of the wine, both the qualitative and the quantitative composition are important. The determination of the geochemical composition of the wine is made with analytical methods. Some of these analytical methods are simple and fast, while others are complex and more time spending. Parallel with the development of the technology for wine production, the analytical methods that determine the geochemical composition are developed as well. There are many reasons that determine the need of wine analyses.

Some of them are the following:

- control of the process of ripening the grape, process of wine production, and wine ageing;
- eliminating and decreasing the possibility for wine putrescence;

- improving and intervention during the production process;
- wine mixing: with precise analyses data are getting for the production of separate wine mixtures;
- issuing certificates for wine export which anticipate detailed analyses, and certain conditions. They are a legal regulative in each country.

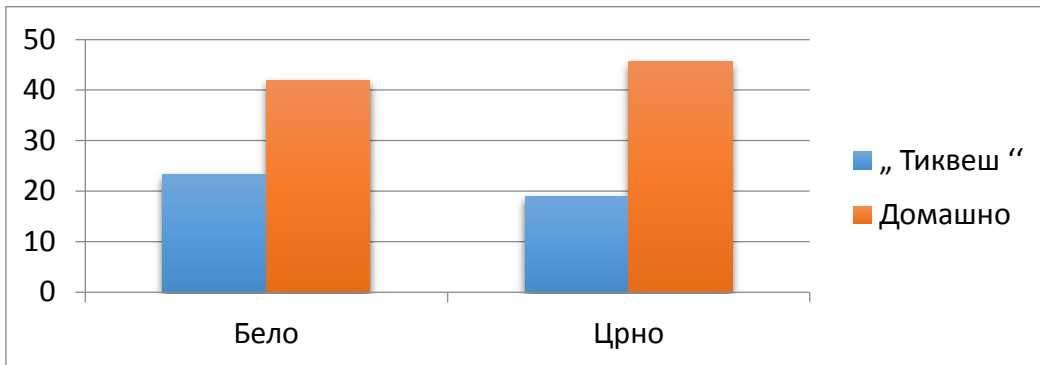
The basic composition of the wine into which all the other substances are dissolved is the water. It consists 2/3 to 4/5 of the wine, which means that in 1 l wine there are 600 to 800 ml water. One of the basic products of the sugar transformation (glucoses and fructose) during the alcohol fermentation is the ethyl alcohol. The volume part of the ethyl alcohol is 90 to 140 ml in 1 l, i.e. 9% to 14%. Apart from the ethyl alcohol, there are other types of alcohol in the wine: glycerol (5-14 g l), 2,3-butandiol (0.3-1.5 g L), and traces of methanol and higher alcohols. From the organic acids in the wine can be find the following: wine, apple, lemon, citric acid, and others. The mass concentration of the total acids in the wine ranges between very wide limits from 4.5 to 12 g L, but in our region there is no wine with larger quantities of the total acid of 9g l (Teran and Rizling). The concentration of the polyphenol compounds (antocyanin and tannin) in wine is from 0.1 to 4 g L. the total nitrogen can be from the ammonia, the amino-acids and from the proteins and it ranges until 1000 mg L. From the elements in the wine, the most present is the Kalium, in an average amount of 1 g L, and after it, come the magnesium, calcium, natrium and phosphorus. From the hard metals, the following are present: Fe, Cu, Zn, Al, Co, Se, Cr, Mn, and lately there is a need of determining the elements like: Li, B, F, Si, V, Ni, As, Sn, Pb and Hg. From the anion the most present are the phosphates, chlorides and sulphates. The aroma substances of the wine are made by the alcohols, aldehydes, ketons, oil acids, esterites, terpenins, and others. The wine is not rich in vitamins, but it consists of the ascorbic acid, thiamin, riboflavin, pyridoxine, cobalamin, nicotinamid, mezoinozitol, panthoten and folic acid, i.e biotin.

Today, most attention is devoted to the link between the nature and the man. The contamination of the environment with toxic elements which are included in the food chain leads to piling up in the organism. It is no longer sufficient to just determine the total concentration because, as it is proved, the toxic depends on the physical and chemical form. It is especially important for the arsenic, mercury, which are well known toxic elements that can be find in various forms.

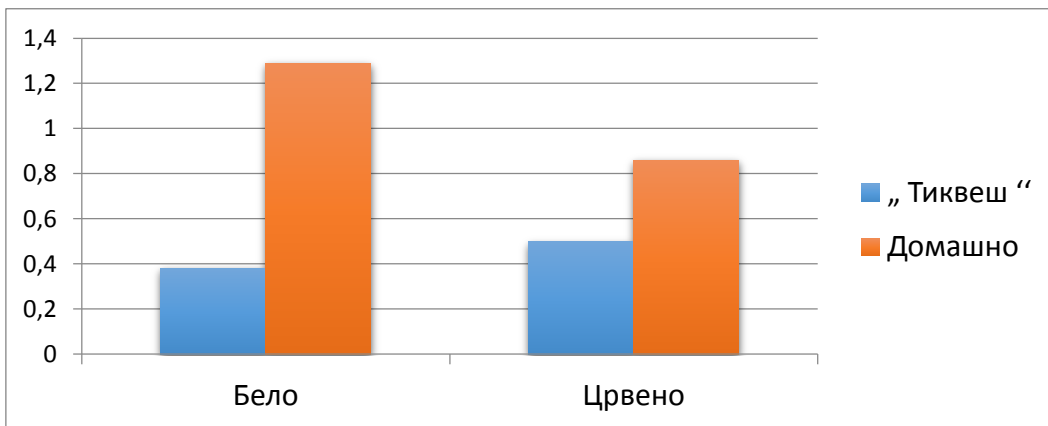
Results and discussion

Results from the investigations of the vine geochemistry there are in the paper of : Julijana Cvetkovic, Sonja Arpadjan, Irina Karadjova, Trajce Stafilov. (2002), Trajče Stafilov, Irina Karadjova (2009), Irina Karadjova, Julijana Cvetkovic, Trajce Stafilov, Sonja Arpadjan (2007), Irina Karadjova, Sonja Arpadjan, Julijana Cvetkovic and Trajce Stafilov (2004), Julijana Cvetković, Trajče Stafilov, Dragan Mihajlović (2001), Krste Tasev, Irina Karadjova, Sonja Arpadjan, Julijana Cvetkovic, Trajce Stafilov (2004, 2006, 2005).

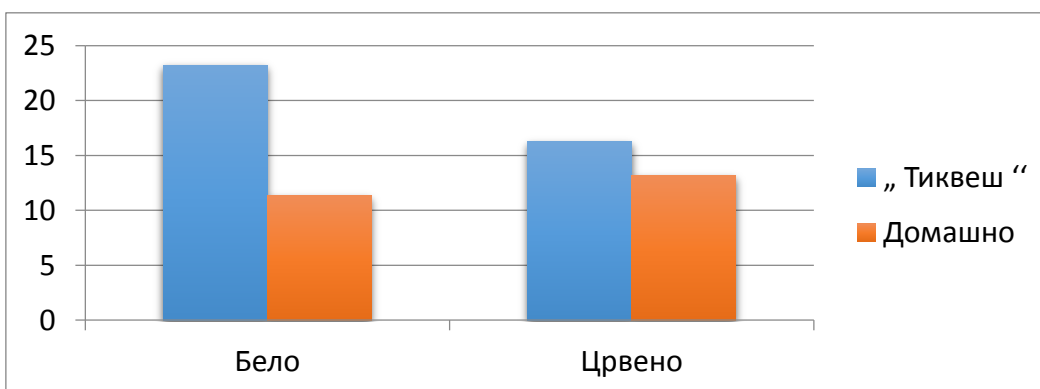
On the base of the geochemical investigations of the vine from the Tikves region is made the following diagrams. From the presented diagrams (Fig.1) it can be concluded that the wine produced in home conditions contain larger concentrations of metals in relation to the wine produced in the winery Tikves.



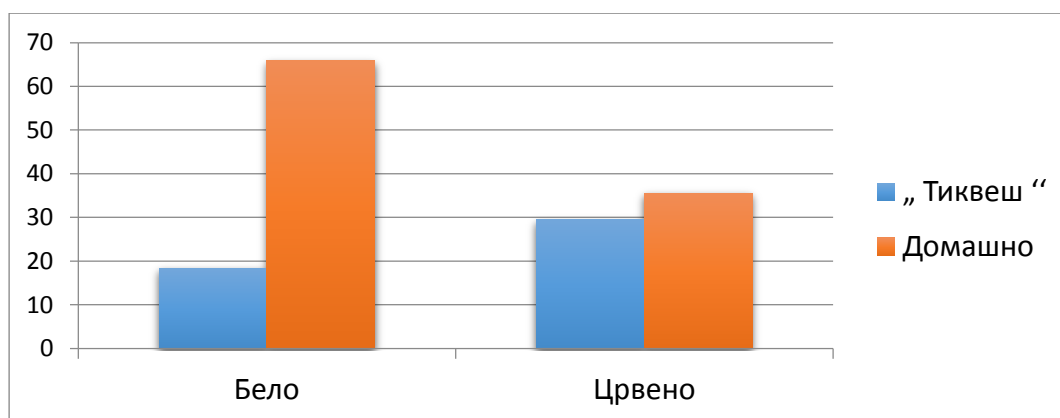
a) As (µg/l)



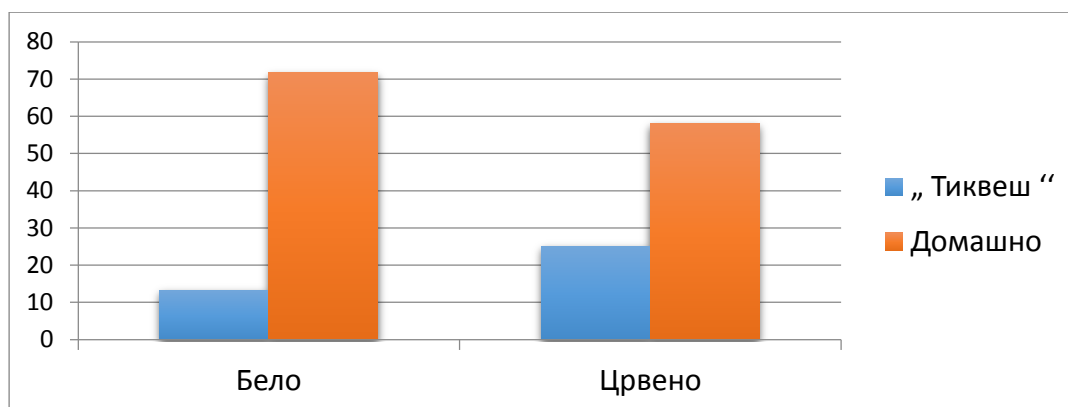
b) Cd (µg/ml)



c) Cr (µg/l)



d) Ni (µg/l)



e) Pb (µg/l)

Fig.1. Contents of Cd, Ni, Cr, Pb и As in the white and red wine in Tikves region

Conclusion

On the base of the conducted research it can be concluded that the presence of some elements in traces (As, Pb, Cd, Cr, Ni) is higher in the homemade wine in comparison with the wine produced in the wineries. This difference is a result of the technological procedures which are applied in the technology of the wine production.

Therefore, it can be concluded that in some cases there can be find a correlation of the presence of elements in traces in the soil systems and the same elements in matrix in wine produced of grapes of those same soils.

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